

The Effects of Diachronous Deposition on the Petroleum Distribution Within the Alaskan North Slope — Insights from 3D Petroleum Systems Modeling

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ABSTRACT

The complex petroleum province of the Alaskan North Slope comprises seven identified petroleum systems. The source rocks associated with these systems occur in the Paleozoic to Mesozoic Ellesmerian and Beaufordian Sequences and are thought to cover most of the North Slope.

Diachronous deposition (progradation) of the overlying Brookian sequence from west (120 Ma) to east (33 Ma) resulted in western and eastern depocenters, which account for the source rocks becoming mature at different times, resulting in distinct petroleum systems. The diachronous deposition, combined with the changing geometry of these systems, resulted in a complex petroleum migration history as depicted by the charging of multiple reservoir rocks.

A three-dimensional, PVT-controlled, n-component, 3-phase petroleum migration model is presented to demonstrate the migration history and present-day petroleum distribution that resulted from the complex geometry and thermal history development of the Alaska North Slope through time.